KESSELRUN

Creating a Cost Estimate for a Software Factory

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Agenda

- Kessel Run Software Factory Overview
  - Introduction to Kessel Run
  - Kessel Run Results
- Software Factory Man Power
  - Product Teams
  - Support Teams
- Systems Engineering/Product Management Support
- Acquisitions/Leadership Support
- Travel & Training
- Software Environment
- Conclusion/Challenges

KESSEL RUN VISION

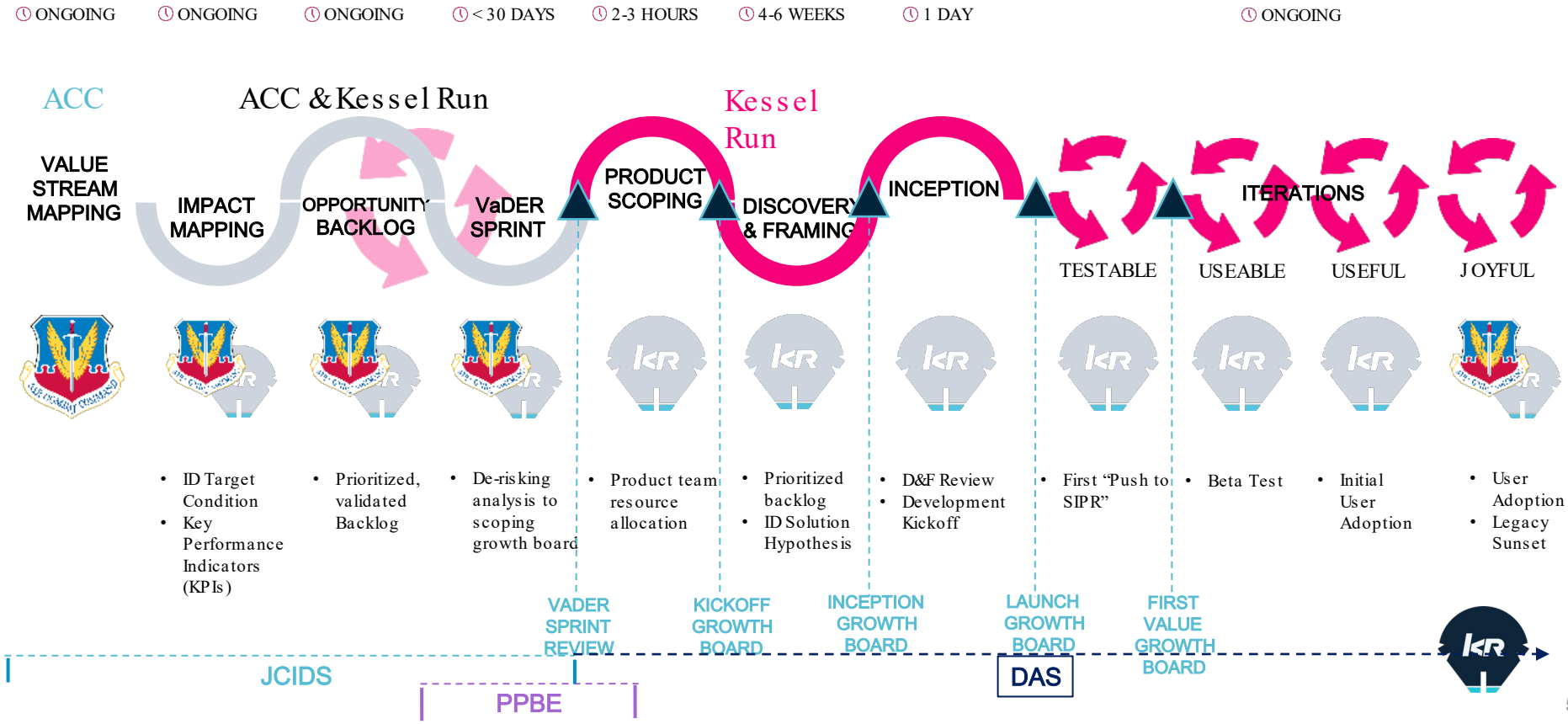
Deliver combat capability that can sense and respond to conflict in any domain, anytime, anywhere.

KESSEL RUN MISSION

Continuously deliver war-winning software the warfighters love.

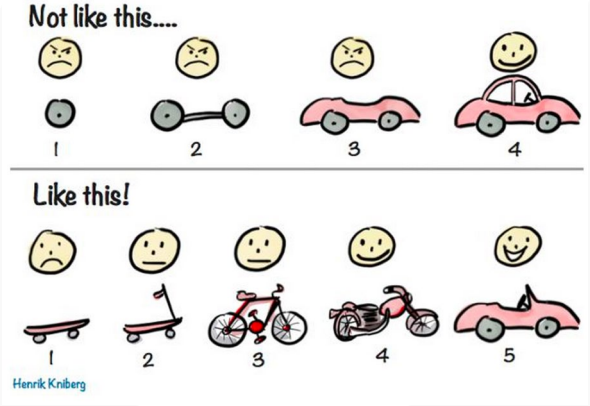
The Kessel Run

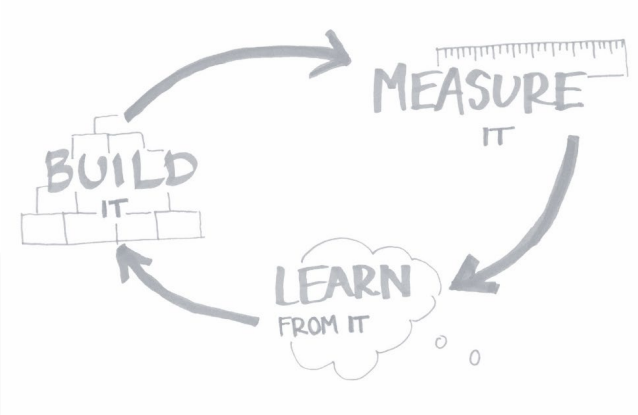
FASTEST TIME THROUGH THE KESSEL RUN = 57 DAYS

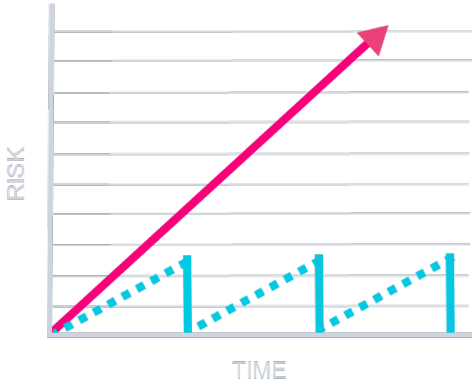


Agile Development = Experimentation in Ops

Developing hypotheses based on user research
Validating solutions based on user testing







Kessel Run Software Development Practices

Lean Product Development

- Reduce the risk of building the wrong thing
- Build-Measure -Learn Feedback loop

User Centered Design

- Focus on always delivering value to users
- Constant iteration & validation of assumptions from user research

Extreme Programming (XP)

- Paired Programming
- Test Driven development

42
balanced teams
73 KR products

8K+
active users

124
days to MVP

85%+
test code coverage

DoD's 1st Continuous ATO

Continuous Delivery to 3 networks

Deployments to production every 11.2 hrs

18 products hosted
8 supporting external customers

Acquisition Concepts

Using FAR Part 8, 12, 13 & 16

- Large requirements: DO/TO from best-in-class IDIQs (Part 16)
- Medium: Multiple Award BPA on GSA Schedule 70 (Part 8)
- Small: Simplified acquisition commercial contract (Part 12, 13.5)
- Small/Med: 8(a) sole source; socioeconomic, programmatic impact

Accepting Volume

- More contracts is not a bad thing
- Volume drives efficiency; doing something once every 5 years does not

Agile Cost Model

"94% of federal IT projects are over budget or behind schedule...40% of those never end up seeing the light of day; they are completely scrapped or abandoned." – Haley Van Dyck, Deputy Administrator, U.S. Digital Services

Product Team Cost Model: Assumptions

- Used Kessel Run as an analogy
- Assumed there are no platform costs
- FTE is full time equivalent that works 1920 hours per year
- Assume no costs with military personnel.

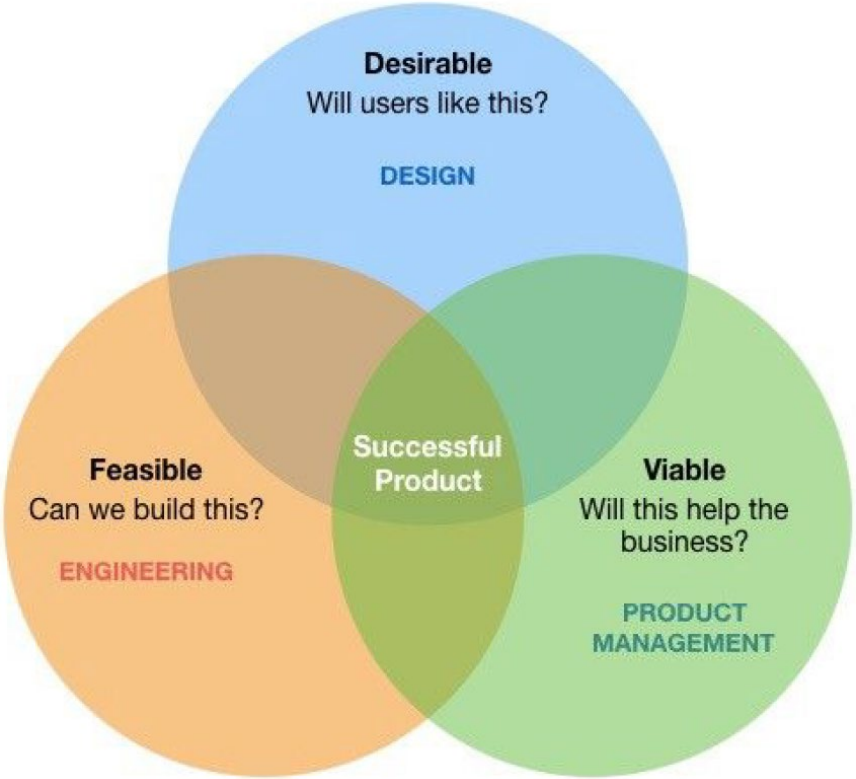
Product Team Cost Model: Compostion

One product team has 6-8 FTEs

Composition of Typical 8 FTE Team:

- 1 Product Manager
- 1 UX Designer
- 3 SW Engineers
- 3 SW Developers

Product Team Composition



Product Manager
Understand the business objectives, stakeholder vision, user needs, and technical challenges

Designer
Engages with the user to understand their pain points and to generate solutions to solve those pain points

Software Engineer
Create software and prioritize to ensure the application is stable, secure, and able to pivot at any notice.

Product Team Cost Model: Enablement

Enablement supports product development by working along side product teams to teach them agile development methods to develop software rapidly and securely.

Our model follows composition as Kessel Run:

1 Director for Enablement*

1 Product Manager

1 Designer

3 Engineers

Product Team Cost Model: Phasing

Product Teams

Start with 8 Product Teams for one year

Add 6 more Product teams the following year

Enablement Support

In the AirOps Branch at Kessel Run pivotal supported the product teams for an average of 13 months.

Our model uses this average to phase enablement with risk of less than likely outcome.

Product Team Cost Model: Labor Rates

Composite Labor Rates

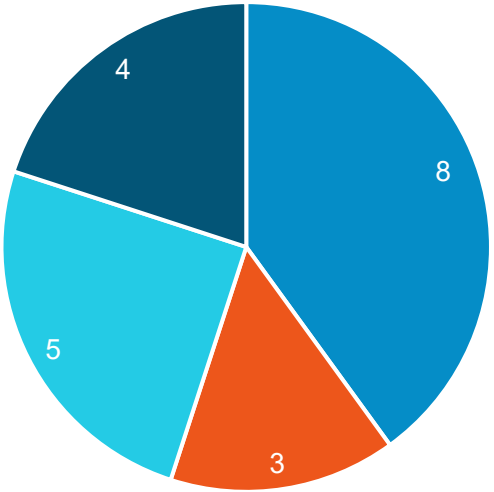
- Contractor composite Labor Rate
- Enablement composite Labor Rate
- Gov GS-12/GS-13 composite Labor Rate

Support Personnel

How are you going to support your people?

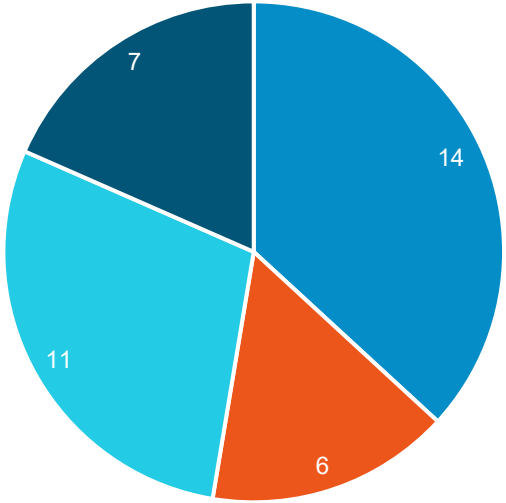
Average FTE: 20

SW Factory Support



Average KR FTE: 38

KR Support



Data/Engineering Support Operations Support Technical Support Assistant Director

Support Personnel

How are you going to support your people?

Data/Engineering Support

FTE 8 (1:2)

Advise on best practices in handling large data sets

Operations Support

FTE 3 (1:5)

Facilitate operational effectiveness

Support Personnel

How are you going to support your people?

Technical Support

FTE 5 (1:3)

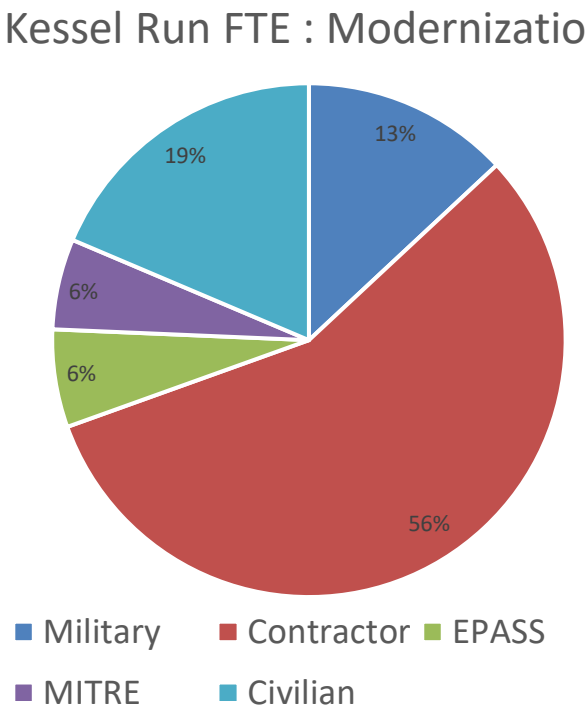
Test and evaluate systems

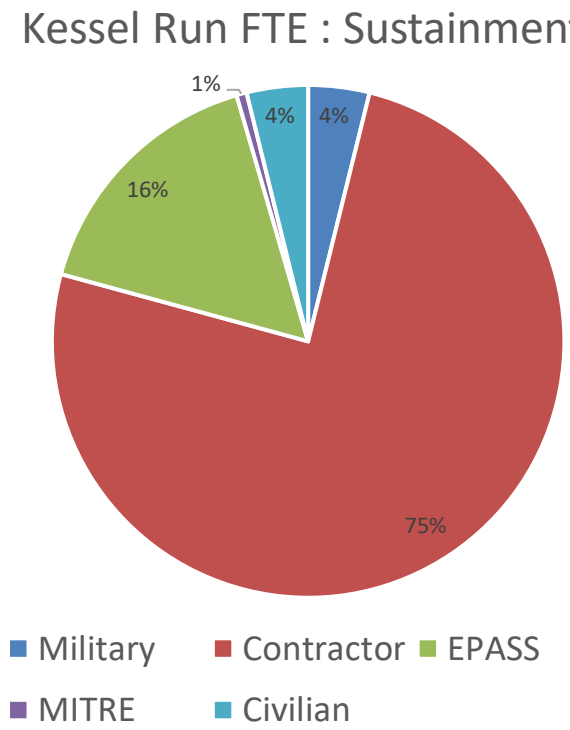
Assistant Director

FTE 4 (3-5 product teams in portfolio)

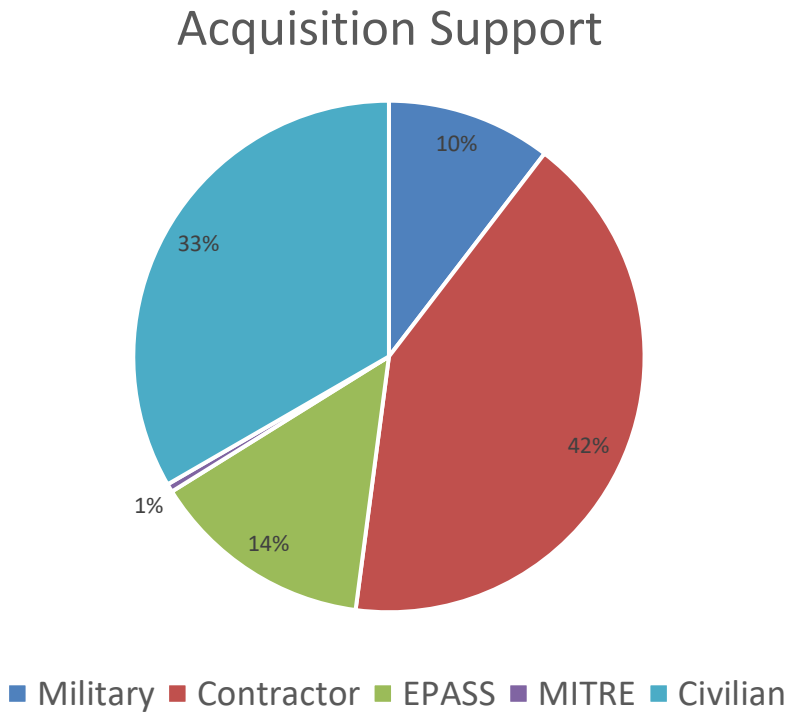
Primary blocker remover for product teams

Software Factory Cost Model:FTE Analysis





Software Factory Cost Model: ACQ Support Analysis



-Acquisition Support exists on all branches

-Examples of Acquisition Labor Categories: Leadership, Contracting, Budget, Cost, Legal Advisor, Facilities Manager, Security Manager

-On average, we see 14.918% acquisition related costs across all branches

Software Factory Cost Model: SEPM Analysis

-Examples of Software Development Labor Categories: Product Manager, Program Manager, Software Engineer, Software Developer, Product Designer

Software Development FTE [DET12]	1,104
Military	91
Contractor	704
EPASS	134
MITRE	40
Civilian	135

Modernization	564
Military	68
Contractor	302
EPASS	40
MITRE	36
Civilian	118

Integration/Sustainment	540
Military	23
Contractor	402
EPASS	94
MITRE	4
Civilian	17

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Software Factory Cost Model: SEPM Analysis

-Labor Categories include Software Engineers, Program Managers, Product Designers

SEPM Split for Program Managers/Product Managers = 90% SEPM / 10% PMP

SEPM Split for Software Engineers = 30% SEPM / 70% PMP

SEPM Split for Product Designers = 50% SEPM / 50% PMP

Modernization Effort	
Traditional Cost Model PMP	56.501%
Traditional Cost Model SEPM	43.499%

Modernization Effort	
KREL Cost Model PMP	75.898%
KREL Cost Model SEPM	24.102%

Software Factory Cost Model: Travel & Training

Travel

Government Travel: 1 FTE trip per month per product team

Travel for Training: training dependent, assume week of travel for training requirement

Product Team Travel: 10 FTEs 3 month LTTDYs to Kessel Run

Training

Theory of Constraints Workshop

Value Stream Mapping

SW Coding Bootcamp

Software Factory Cost Model: Software Environment

Teams	FTES	Seats per team
Product Team	8	13
Enablement Support	5	

Teams	Total Seats
Teams 1-8	104
Teams 9-14	78
Enablement Director	1
Support Personnel	20
Total Seats	**203**

The SW Environment was costed out by number of seats for KREL

Our model has 203 seats for product teams, enablement support, and support personnel. The cost per seat was $775.00 in 2018.

Challenges:

- Since Kessel Run is still a fairly new SW factory, not a lot of data is available
- Still working out methods for accurately portraying data and keeping it up to date
- There is not many other SW factories as far along to compare our model to
- There is no appropriation strictly for SW development

Conclusion:

This is the methodology we created based on our experience and the history of Kessel Run. This model serves as a template to cost out the standing up of a software factory.

The SEPM and Acquisition Support Analysis shows that Kessel Run has different acquisition and SEPM costs than a traditional AF software development program.

- 15 percent additional cost in acquisition support
- lower SEPM percentages depending on the FTE positions in the branch.

Conclusion:

If you want to follow this cost model, questions you need to ask:

- Are you going to ride off of a platform?
- What is the composition of your product team?
- What kind of enablement support will you need?
- How many product teams can you support?
- How many and what type of support personnel do you need?
- Where will people sit?
- What is your funding structure?
- What is your fixed budget? What can you afford?

Questions?

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KESSELRUN

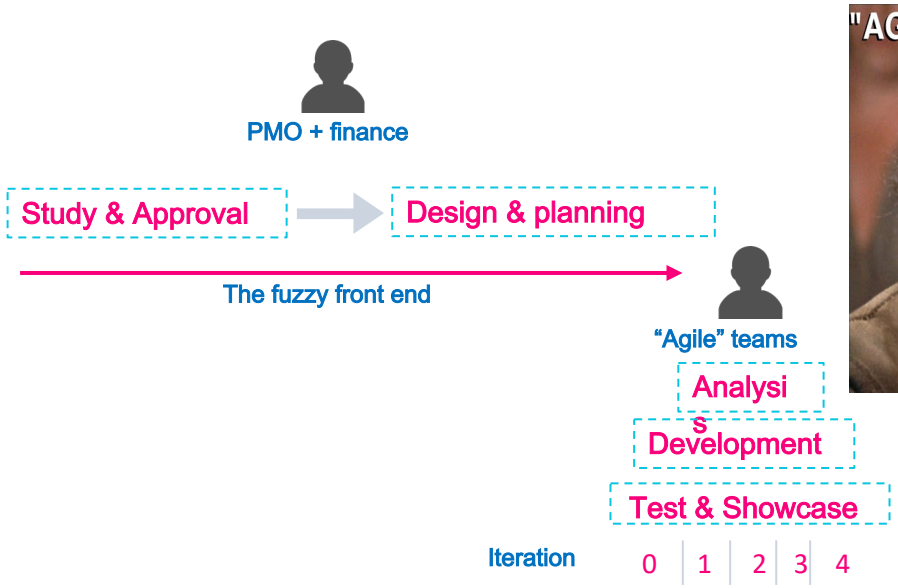
Code. Deploy. Win.

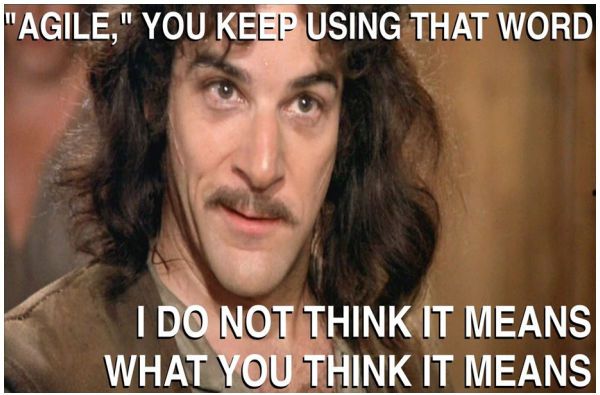
Join the Alliance!

https://kesselrun.af.mil

Back Up

Not Agile





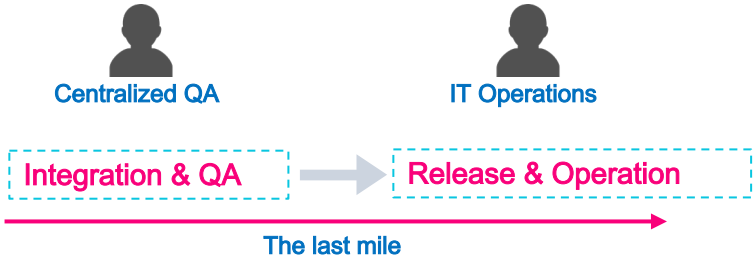
water -

scrum -

fall -

Agile Litmus Tests:

1) When was the last time you deployed software into ops?
2) What did you learn?
3) How do you know?
4) What is your cycle time?



@jezhumble

Code. Deploy. Win.

Innovation Tactics

Other Transactions

Prototyped methodology to assist in enablement

- Not governed by the FAR or supplements
- Access to highly specialized non-traditional contractor
- Leveraged follow-on production statute to award sole source Production OTs

OT authority is utilized when a FAR-based contract cannot be used

Modular Contracts

Commercial services bought in logical blocks

- Focus on speed and quality
- Lowers thresholds
- Reduces barriers to entry
- Enabled by Section 804

Attempting to fully embrace FAR 39

Innovation Tactics

Time & Materials

Best contract type for Agile Development; least preferred, high approval levels

- $450M Class D&F for T&M/LH for Agile DevOps, CI/CD
- Active for 5 years, for contracts up to 5 years
- 1 page memo to utilize, tracked by COCO

8 Actions, $57M, saved >400 days of schedule

Streamlined Evaluations

Competitive evaluations using FAR Part 13.5, 8.4

- Basic written proposal
- Oral presentation
- Paired programming assessment
- Video proposals
- Online design portfolios

"Show me, don't tell me" approach works

Innovation Tactics

Modern Business Tools

DDS authorized PEO Digital to use better tools

- Mattermost - communication & collaboration
- GSuite - email, structured sharing, scheduling
- Trello - task tracking, accountability
- Responsive, always working, user-friendly

Easy to learn, faster, intuitive,value-added

Agile Playbook

A comprehensive "playbook" for agile acquisition

- Process guidance & flows
- Market Research
- Document library
- Agile primers
- Template docs/language, terms, samples

Easy to learn, faster, intuitive,value-added